

THAT WHICH IS CLAIMED IS:

1. An isolated polynucleotide encoding the  $\sigma_{1\beta}$  receptor, said polynucleotide selected from the group consisting of:

(a) polynucleotides having the nucleotide sequence of **SEQ ID NO:1**;

(b) polynucleotides that hybridize to DNA of (a) above under stringent conditions and which encode  $\sigma_{1\beta}$ ; and

(c) polynucleotides that differ from the DNA of (a) or (b) above due to the degeneracy of the genetic code, and that encode  $\sigma_{1\beta}$  encoded by a DNA of (a) or (b) above.

2. An isolated polynucleotide according to Claim 1 that encodes the  $\sigma_{1\beta}$  receptor

3. An isolated polynucleotide according to Claim 1 that encodes  $\sigma_{1\beta}$  having the amino acid sequence given herein as **SEQ ID NO:2**.

4. An isolated polynucleotide according to Claim 1 which is a DNA having the nucleotide sequence given herein as **SEQ ID NO:1**.

5. An expression vector comprising a nucleic acid according to Claim 1.

6. A cell comprising an expression vector according to Claim 5.

7. A cell comprising an expression vector according to Claim 6 and capable of expressing  $\sigma_{1\beta}$ .

8. An isolated protein encoded by a polynucleotide according to Claim 1.

9. An isolated protein encoded by a polynucleotide of Claim 1 that has the amino acid sequence given herein as **SEQ ID NO:2**.

10. An antibody which specifically binds to a protein encoded by a polynucleotide according to Claim 1.

5 11. A method for producing a protein comprising the amino acid sequence of **SEQ ID NO:2**, or a fragment thereof, comprising

(a) culturing a host cell containing an expression vector containing at least a fragment of the polynucleotide sequence encoding  $\sigma_{1\beta}$  under conditions suitable for the expression of the protein; and

10 (b) recovering the protein from the host cell culture.

12. A method for detecting a polynucleotide which encodes  $\sigma_{1\beta}$  in a biological sample comprising:

15 (a) hybridizing the complement of the polynucleotide sequence which encodes **SEQ ID NO:1** to nucleic acid material of a biological sample, thereby forming a hybridization complex; and

b) detecting the hybridization complex, wherein the presence of the complex correlates with the presence of a polynucleotide encoding  $\sigma_{1\beta}$  in the biological sample.

20 13. An isolated polynucleotide encoding  $\sigma_{1\beta}$ , said polynucleotide selected from the group consisting of:

(a) polynucleotides having the nucleotide sequence of **SEQ ID NO:3**;

25 (b) polynucleotides that hybridize to polynucleotides of (a) above under stringent conditions and which encode  $\sigma_{1\beta}$ ; and

(c) polynucleotides that differ from the polynucleotides of (a) or (b) above due to the degeneracy of the genetic code, and that encode  $\sigma_{1\beta}$  encoded by a polynucleotides of (a) or (b) above.

30 14. An isolated polynucleotide according to Claim 13 that encodes  $\sigma_{1\beta}$ .



(a) hybridizing the complement of the polynucleotide sequence which encodes **SEQ ID NO:3** to nucleic acid material of a biological sample to form a hybridization complex; and

b) detecting the hybridization complex, wherein the presence of the complex correlates with the presence of a polynucleotide encoding  $\sigma_{1\beta}$  in the biological sample.

25. A method for screening for a ligand capable of binding to a  $\sigma_{1\beta}$  receptor, said method comprising:

a) combining the  $\sigma_{1\beta}$  receptor and a candidate compound; and  
b) determining the binding of said candidate compound to said  $\sigma_{1\beta}$  protein, wherein binding of the candidate compound to the  $\sigma_{1\beta}$  receptor indicates that the candidate compound is a ligand for the  $\sigma_{1\beta}$  receptor.

26. The method according to Claim 25, wherein the candidate is an organic molecule.

27. The method according to Claim 25, wherein the  $\sigma_{1\beta}$  receptor has the sequence set forth in **SEQ ID NO:2**.

28. The method according to Claim 25, wherein the  $\sigma_{1\beta}$  receptor has the sequence set forth in **SEQ ID NO:4**.

29. A method for screening for a ligand capable of binding to a  $\sigma_{1\beta}$  receptor, said method comprising:

(a) providing a  $\sigma_{1\beta}$  receptor by (i) transfecting a host cell with a polynucleotide that encodes the lymphocyte receptor polypeptide having an amino acid sequence selected from the group consisting of **SEQ ID NO: 2** and **SEQ ID NO: 4**, and (ii) maintaining said transformed cell under biological conditions sufficient for translation of said nucleotide sequence so as to express the  $\sigma_{1\beta}$  receptor polypeptide;

b) combining a candidate compound with the  $\sigma_{1\beta}$  receptor set forth in (a); and then

(c) determining the binding of said candidate compound to said  $\sigma_{1\beta}$  protein, wherein binding of the candidate compound to the  $\sigma_{1\beta}$  receptor indicates that the candidate compound is a ligand for the  $\sigma_{1\beta}$  receptor.

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30. The method according to Claim 29, wherein step (a) is carried out by (i) transfecting a host cell with a nucleotide sequence selected from the group consisting of **SEQ ID NO:1** and **SEQ ID NO:3** to form a transformed cell that encodes a  $\sigma_{1\beta}$  receptor polypeptide, and (ii) maintaining said transformed cell under biological conditions sufficient for translation of said nucleotide sequence so as to express the  $\sigma_{1\beta}$  receptor polypeptide.

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31. A method for determining the proliferative status of cancer cells that express  $\sigma_1$  receptors and  $\sigma_{1\beta}$  receptors, comprising:

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(a) contacting the cells with a detectably labeled  $\sigma_1$  receptor ligand and a detectably labeled  $\sigma_{1\beta}$  receptor ligand, and

(b) determining the extent to which the ligands bind to the cells, wherein the extent provides a measure of the proliferative status of the cell.

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32. A method for determining the proliferative status of cancer cells that express  $\sigma_1$  receptors and  $\sigma_{1\beta}$  receptors, comprising:

determining the density of  $\sigma_1$  receptors and  $\sigma_{1\beta}$  receptors of the cell, wherein density is measured by the amount of binding of  $\sigma_1$  receptor ligands to  $\sigma_1$  receptors and the amount of binding of  $\sigma_{1\beta}$  receptor ligands to  $\sigma_{1\beta}$  receptors; and then

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comparing the density of  $\sigma_{1\beta}$  receptors to the density of  $\sigma_1$  receptors of the cell, wherein a higher density of  $\sigma_{1\beta}$  receptors as compared to  $\sigma_1$  receptors indicates that the cancer cells are in a proliferative state.

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